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Influences of Carbon and Silicon on the Running Quality of Molten Cast Iron

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The running quality measuring apparatus consists of a cast iron mould having a straight, horizontal test canal, whose length is about 60 cm and whose cross section is an inverted, equilateral triangle, one side of which is 7 mm long, a dry sand mould of an inverted circular cone type, whose inner volume is about 120 c.c. and acting as the molten iron reservoir and a dry sand mould having a horn gate, which connects the test canal and the reservoir. The assembly of these three moulds are horizontally placed. The bottom opening of the reservoir is closed with a graphite stopper, so that the reservoir holds the molten iron of the constant head just before pouring.

About 1 kg. of cast iron, which had been prepared by melting the blast furnace pig iron, steel scrap, breezes of electrode graphite and ferro-silicon and casting into the green sand mould, was melted in a No. 3 graphite crucible in a kryptol furnace. After the melt was heated to the maximum temperature 1450°C and held at this temperature for 10 min., it was transferred into the reservoir, which had been heated at about 700°C in the furnace, taken out of the furnace just before the test and assembled to the horn gate mould for the purpose of the protection of the chilling. When the melt in the reservoir reached the casting temperature, the stopper was taken off. The casting temperature was about 50°C above the liquidus, which was determined by the thermal analyses, and measured by the Pt-Pt·Rh thermo-couple. The running quality was measured by the length of flow solidified in the test canal.

The results obtained are as follows:

(1) The running quality of cast iron containg C 3.22%, Si 3.62%, Mn 0.39%, P 0.41%, S 0.10% and Cu 0.206%, increases with the rise of the maximum heating temperature up to 1400°C, but there is little change within the limits of 1400°C and 1480°C.

(2) The running quality of cast iron, containing C 1.95–4.0% and Si 1.28–5.25%, increases gradually with the increse of the carbon content and rapidly from the neighbouhood of the binary eutectic composition. Such phenomena are noticed also in the case of silicon content.

According to Piwowarsky, the running quality of cast iron decreases with the increase of the solidification range in the limits of Sc = 0.66–0.94, but in this study it is noticed that the running quality of molten cast iron does not decrease even when Sc is greater than$_1$ but tends to increase.